CLAIMS

1. An apparatus comprising:

photodetectors disposed to receive photons from a scintillator block of a PET scanner and configured to provide a measured photodetector signal indicative of a distribution of photons detected by the photodetectors; and

wavelength-shifting fibers disposed to receive photons from the scintillator block and configured to provide a measured fiber signal indicative of a distribution of photons received by the fibers.

2. The apparatus of claim 1, further comprising a processor configured to estimate a location of a photon source based on the measured photodetector signal and on the measured fiber signal.

3. The apparatus of claim 2, wherein the processor is configured to estimate a location of a photon source based on a reference photodetector signal.

4. The apparatus of claim 2, wherein the processor is configured to estimate a location of a photon source based on a reference fiber signal.

5. The apparatus of claim 2, wherein the processor is configured to estimate an extent to which the estimated location is the correct location.

6. The apparatus of claim 3, further comprising a stored calibration table containing values derived from the set of known photodetector signals.

7. The apparatus of claim 4, further comprising a stored calibration table containing values derived from the set of known fiber signals.

8. The apparatus of claim **2**, wherein the processor is configured to estimate a location of a photon source by estimating the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons emitted at the photon source.

9. The apparatus of claim **2**, wherein the processor is configured to estimate a location of a photon source by:

estimating the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons emitted at each of a plurality of photon sources.

10. The apparatus of claim **9**, wherein the processor is configured to estimate a location of a photon source by determining which of the photon sources is associated with the maximum likelihood that the measured photodetector signal and the measured fiber signal resulted from photons emitted at that photon source.

11. The apparatus of claim **2**, wherein the processor is configured to estimate a location of a photon source by:

estimating a first value indicative of a first likelihood, the first likelihood being the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons emitted at a first photon source;

estimating a second value indicative of a second likelihood, the second likelihood being the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons emitted at a second photon source;

determining, on the basis of the first and second values, that the first likelihood is greater than the second likelihood; and

designating the first photon source to be the photon source from which from which the photons that caused the measured photodetector signal and the measured fiber signal were emitted.

12. A method comprising:

obtaining a measured photodetector signal indicative of a distribution of photons received by a plurality of photodetectors from a photon source on a scintillator block of a PET scanner; and

obtaining a measured fiber signal indicative of a distribution of photons received by a plurality of wavelength-shifting fibers extending across the scintillator block from a photon source on a scintillator block.

13. The method of claim **12**, further comprising estimating a location of the photon source on the scintillator block based on the measured photodetector signal and on the measured fiber signal.

14. The method of claim **13**, wherein estimating a location of the photon source comprises estimating the location based on a reference photodetector signal.

15. The method of claim **13**, wherein estimating a location of the most likely photon source comprises estimating the location based on a reference fiber signal.

16. The method of claim **13**, further comprising estimating an extent to which the estimated location is the correct location.

17. The method of claim **14**, further comprising reading a stored calibration table containing values derived from the set of known photodetector signals.

18. The method of claim **15**, further comprising reading a stored calibration table containing values derived from the set of known fiber signals.

19. The method of claim **13**, wherein estimating a location of the photon source comprises estimating the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons emitted at the photon source.

20. The method of claim **13**, wherein estimating a location of a photon source comprises:

estimating the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons emitted at each of a plurality of photon sources.

21. The method of claim **13**, wherein estimating a location of a photon source comprises:

identifying, from a plurality of photon sources, a photon source having the property that the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons emitted at that photon source is greater than the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons emitted at a source other than that photon source.

22. The method of claim **13**, wherein estimating a location of a photon source comprises:

estimating a first value indicative of a first likelihood, the first likelihood being the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons emitted at a first photon source;

estimating a second value indicative of a second likelihood, the second likelihood being the likelihood that the measured

photodetector signal and the measured fiber signal resulted from photons emitted at a second photon source;

determining, on the basis of the first and second values, that the first likelihood is greater than the second likelihood; and

designating the first photon source to be the photon source from which from which the photons that caused the measured photodetector signal and the measured fiber signal were emitted.

23. A computer-readable medium having encoded thereon software for estimating a location of a most-likely photon source on a scintillator block, the software comprising instructions for:

obtaining a measured photodetector signal indicative of a distribution of photons received by a plurality of photodetectors from a photon source on a scintillator block;

obtaining a measured fiber signal indicative of a distribution of photons received by a plurality of wavelength-shifting fibers extending across the scintillator block from a photon source on a scintillator block; and

estimating a location of a most-likely photon source on the scintillator block at least in part on the basis of the measured photodetector signal and at least in part on the basis of the measured fiber signal.

24. The computer-readable medium of claim **23**, wherein the instructions for estimating a location of a most-likely photon source comprise instructions for comparing the measured photodetector signal with a set of known photodetector signals and comparing the measured fiber signal with a set of known fiber signals.

25. The computer-readable medium of claim **24**, wherein the software further comprises instructions for reading a stored calibration table containing values derived from the set of known photodetector signals.

26. The computer-readable medium of claim **24**, wherein the software further comprises instructions for reading a stored calibration table containing values derived from the set of known fiber signals.

27. The computer-readable medium of claim **23**, wherein the instructions for estimating a location of a most-likely photon source comprise instructions for estimating the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons emitted at the most-likely photon source.

28. The computer-readable medium of claim **23**, wherein the instructions estimating a location of a most-likely photon source comprise instructions for:

estimating the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons emitted at each of a plurality of photon sources; and

determining which of the plurality of photons sources is associated with the maximum likelihood that the measured photodetector signal and the measured fiber signal resulted from photons emitted at that photon source.

29. The computer-readable medium of claim **23**, wherein the instructions for estimating a location of a most-likely photon source comprise instructions for:

estimating the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons emitted at a each of a plurality of photon sources; and

identifying, from the plurality of photon sources, a most-likely photon source having the property that the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons emitted at the most-likely photon source is greater than the likelihood that the measured photodetector signal and the measured fiber signal resulted from photons emitted at a source other than the most-likely photon source.